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WASHINGTON ASSEMBLY OF THE INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS AND THE AMERICAN GEOPHYSICAL UNION

By Dr. J. A. FLEMING

GENERAL SECRETARY, AMERICAN GEOPHYSICAL UNION

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

THE Seventh General Assembly of the International Union of Geodesy and Geophysics was held at Washington, D. C., September 4 to 15, 1939. The various organizing committees of the American Geophysical Union, in collaboration with the National Research Council, made adequate preparations for the reception and entertainment of some 800 delegates and guests. Unfortunately the war in Europe broke out just before the assembly convened and prevented the attendance of many foreign delegates and guests who had registered for the meetings. Despite these adverse conditions, there was a total actual registration and attendance of 719 delegates and guests, including 120 from foreign countries representing 26 nations of the 38 that had designated delegates. The total number of delegates and guests who had promised attendance included 246 from outside the United States and 701 from the United States, a grand total of 947. The wide-spread interest aroused by the assembly in the United States is demonstrated by the fact that 79 universities and scientific and commercial research organizations sent representatives in addition to those delegated by 18 bureaus and services of the United States Government. A considerable number of French

and British delegates who had already arrived in the United States were recalled by their governments before the opening of the assembly. Germany was represented by three delegates, although the main delegation did not arrive in America, their vessel having turned back while en route. There was a good representation from the Latin-American countries.

On August 30, when the European political crisis was at its height, it was decided by the executive committee, after consultation with the United States Department of State, that, because of the large number of delegates already in Washington and of the great amount of scientific material to be presented, the Assembly should be held as scheduled but that its activities should be confined to scientific matters only.

The officers were accordingly continued until the next general assembly or until such time as the executive committee of the Union may decide. The presidents and secretaries of the Union and its associations are as follows (the name of the President preceding that of the Secretary):

Union—D. la Cour (Denmark), H. St. J. L. Winterbotham[1] (Great Britain); *Geodesy*—F. A. Vening Meinesz (Holland), G. Perrier[1] (France); *Seismology*—N. H. Heck (U. S. A.), E. Rothé[1] (France); *Meteorology*—S. Chapman (Great Britain), J. Bjerknes (Norway); *Terrestrial Magnetism and Electricity*—J. A. Fleming (U. S. A.), A. H. R. Goldie[2] (Great Britain); *Oceanography*—B. Helland-Hansen (Norway), J. Proudman (Great Britain); *Volcanology*—A. Michel-Lévy[2] (France), F. Signore[2] (Italy); *Hydrology*—O. Lütschg[2] (Switzerland), F. Diénert[1] (France).

In the absence of Brigadier H. St. J. L. Winterbotham, Dr. William Bowie, ex-president of the Union, took over the duties of general secretary, Vice-President Slettenmark (Sweden) presided at the meetings of the Association of Hydrology, and Dr. L. H. Adams was chosen acting president of the Association of Volcanology, all its officers being absent. The functions of the five absent secretaries of associations were assumed by representatives of the corresponding sections of the American Geophysical Union.

The meetings were held mainly in the buildings of George Washington University, and the adequacy of the quarters assigned contributed greatly to the comfort and convenience of the meetings. At a special convocation of the University on September 11, honorary degrees of doctor of science were conferred upon President D. la Cour, and *in absentia,* upon General Secretary Winterbotham. The assembly was also accorded the use of the Departmental Auditorium, the auditorium of the Department of Commerce, the auditorium of the Department of the Interior, and Elihu Root Hall of the Carnegie Institution of Washington. Rooms for committee meetings and suites for the president and general secretary of the International Union were generously contributed by the Hotel Washington, which served as the headquarters hotel of the assembly.

[1] Called home before the Assembly.
[2] Not present at the Washington Assembly.

The assembly was formally opened on the evening of September 7 at the Departmental Auditorium. An address of welcome by the Secretary of State, Cordell Hull, was read by the Honorable Hugh Wilson and was followed by a response from Professor S. Chapman, chairman of the British National Committee. President C. H. Marvin of George Washington University spoke on behalf of local institutions, President F. B. Jewett of the National Academy of Sciences spoke on behalf of science in America, and the meeting closed with the presidential address of Dr. D. la Cour. This function included music by the United States Marine Band.

In addition to a number of special trips of the several associations during the meetings, two excursions were made under the auspices of the Union, one to Mount Vernon and Arlington, and an all-day excursion to Skyline Drive, the Caverns of Luray and the Shenandoah Valley, with a luncheon at the Hotel Mimslyn, Luray, Virginia. One conducted pre-assembly trip was made from Watertown, New York, through the Alleghany Region to Washington. A five-day excursion for hydrologists in Pennsylvania and Ohio, and a trip to Pittsburgh, Pennsylvania, were cancelled because of the desire of delegates and guests from abroad to return home at the earliest opportunity following the close of the assembly.

The outstanding social function was the reception and dance tendered by the United States Government at the building of the Pan-American Union. The delegates were received by Assistant Secretary of State Berle and Mrs. Berle for the Department of State and by President Field and Mrs. Field for the American Geophysical Union. The United States Marine Orchestra provided music.

Many other social functions provided ample entertainment and opportunity for personal contacts. These included: A tea and exhibit at the National Geographic Society; personally conducted visits to points of interest in and around Washington; two public popular lectures; teas given by the Ladies' Entertainment Committee; and farewell reception, motion pictures, dance and buffet supper.

At the final plenary session of the Union on September 15, reports of progress during the assembly were made by the presidents of the respective associations and commissions. Eighteen resolutions were adopted pertaining to international collaboration in geophysics in addition to resolutions expressing appreciation and thanks to the government of the United States, the president and trustees of George Washing-

n University, the president and board of trustees the National Geographic Society, the many indidual public and private organizations, and the ational Research Council and the American Geohysical Union for the preparations, generosity, wholearted cooperation and hospitality which made posible the success of the assembly at Washington aiming the progress of geodesy and geophysics for the benef of science and of all countries. Besides these resolutions adopted by the Union as a whole, there were many detailed resolutions adopted by the respective associations pertaining to matters within the province of each association.

On September 15, following the final plenary session, the officers of the International Union were received for a brief conference by President Roosevelt.

An extensive exhibit of geophysical instruments, charts interpreting geophysical data, and models was a major feature of the assembly. The exhibitors included interested departments and bureaus of the United States Government, American universities and research organizations and American instrument-making companies. The American Geophysical Union exhibited a large series of charts showing the results of geophysical exploration as applied to continental and oceanic structure. One whole day was devoted to a special hydrological exhibit and scientific papers on hydrology at the National Bureau of Standards.

The exclusion of administrative matters and discussions pertaining to statutes and finances, which at some of the assemblies have consumed much time, left greater opportunity for the presentation and discussion of scientific papers and reports, many of which had been circulated in full or in abstract beforehand. The associations arranged for the continuance or modification of important international enterprises, although no arrangements could be made for entertaining new projects. Thus, despite the unpropitious world political conditions, the assembly proved to be one of the most important yet held by the Union.

There were two unique features at the Washington Assembly. (a) The program was so arranged that the seven addresses of presidents of associations were presented on different days, permitting attendance of all delegates and guests—a feature serving an admirable purpose to effect *union* of interests. (b) This purpose was further served by a large number of joint meetings of two or more associations to discuss symposia involving common interests; the joint meetings of associations were also held with the International Union's Commission on Continental and Oceanic Structure.

The topics discussed at the assembly ranged from the small-scale local changes in geophysical conditions caused by mineral deposits and the water-regimen of a typical alpine glacier watershed to the world-wide seismic vibrations initiated by great earthquakes and large-scale oceanic currents. More than other branches of science, geophysical research depends on international collaboration. In the words of one of our foreign delegates:

> This idea dominated the proceedings and appeared so obvious to all that it was hardly mentioned. Yet, the fact that under great political stress no discord marred the harmony of the meetings must be regarded as a success well earned as well by the presidents and the officers of the International Union and of its associations as by the leaders of the National Research Council and the American Geophysical Union who, as congenial hosts, rose to the occasion in providing perfect facilities and memorable atmosphere of good-will and cooperation.

The following quotation from the remarks of President la Cour at the final plenary session of the assembly is particularly appropriate:

> Now it is a reality that the Washington General Assembly of the International Union of Geodesy and Geophysics has been held and that it has been an extremely important meeting, furthering our science and showing to the world a battlefield where only victory can be recorded because even the overthrow of a theory is a victory for truth. Words are not sufficient to express our gratitude towards our hosts. I beg them to believe that we will carry away from here and forever the memory of a very happy period in our life, despite the war clouds that have gathered around us.

Communications presented at the assembly.—The total number of addresses, including two public addresses, scientific communications and reports, presented at the assembly was 492 (general Union and its communications, including two public addresses, 27; geodesy, 73; seismology, 40; meteorology, 35; terrestrial magnetism and electricity, 107; oceanography, 48; volcanology, 34; hydrology, 128). As will be seen from the above, the affairs of the International Union proceeded normally despite the disturbed world conditions. There is every evidence in the correspondence with the officers of the Union since the assembly that preparation of printed volumes of transactions of the union and of each of the seven associations is being made. Thus General Secretary Winterbotham has already sent for correction manuscript of the greater part of the transactions for the Union; the secretary of the Association of Terrestrial Magnetism and Electricity advises that the transactions of that association are already in proof, and we have similar word from secretaries of other associations, particularly the Association of Hydrology, the transactions of which are planned to appear in four volumes. This general feeling that the International Union of Geodesy and Geophysics will continue to function is indicated also by the arrangements entered into through the executive committee of that body and the general secretary for

the establishment of four accounting centers (France, Norway, United States of America and England) through which collections of dues of adhering countries are to be made.

In view of the paramount importance in all human endeavor in life of the physics of the earth from both scientific and economic viewpoints and of the spirit of the present officers, it seems that we may look forward to the continuation of the International Union of Geodesy and Geophysics as a functioning body although the Eighth Triennial Assembly set for Bergen, Norway, in 1942 may have to be postponed.

AMERICAN GEOPHYSICAL UNION

The executive committee of the American Geophysical Union has continued to act as the advisory body on geodesy and geophysics to the National Research Council in the relations with the International Union of Geodesy and Geophysics. The total membership of the Union April 26, 1940, was 1,264—a net gain of 140 during the past year. The transactions of the Union for 1939 contained in four volumes totaling 741 pages, including 153 papers and reports, have been published and distributed except for some 300 volumes held for future distribution in Europe pending the resumption of the International Exchange Service with European countries now at war. The edition was 2,000 copies.

In 1940 a regional meeting of the Section of Hydrology and the Western Interstate Snow-Survey Conference was held at Stanford University, California, January 12 and 13. Arrangements have been made for another regional meeting of the section and of the Western Interstate Snow-Survey Conference at Seattle, Washington, June 20 to 23, 1940. The twenty-first annual meetings of the Union and of its sections were held April 24 to 27, 1940. The Union also took part in two symposia bearing on "Application of mathematics and Earth's physics" and "Hydrologic problems in the Ohio and Michigan basins" during the Columbus meeting of the American Association for the Advancement of Science in December, 1939. These and the papers and reports presented at the twenty-first annual meeting will be published in the Union's volumes of transactions for 1940.

Following a mail ballot sent to all members of the Union, an eighth section has been formed, namely, the Section of Tectonophysics, the object of which is to promote and encourage research of fundamental importance to our knowledge of earth structure not covered in any one of the seven sections of the Union. The affiliations with this section already total 275.

The William Bowie Medal endowed by friends and coworkers of Dr. William Bowie and established by vote of the executive committee of the Union on March 1, 1939, to be awarded for distinguished attainment and outstanding contribution to the advancement of cooperative research in fundamental geophysics, was designed, and dies were prepared during 1939. The first and particularly fitting award of the medal was to William Bowie. The second award was made at the General Assembly of the Union on April 26 to Dr. Arthur Louis Day.

The Union was represented by five delegates at the Sixth Pacific Science Congress, July 24 to August 12, 1939, and has also designated 16 delegates to the coming Eighth American Scientific Congress, May 10 to 18, 1940.

In conclusion, it is felt that the American Geophysical Union has continued to take effective part in the advance of scientific and economic aspects of geophysical research and in the coordination of international and national activities.

SCIENTIFIC EVENTS

REPORT OF THE BROOKLYN BOTANIC GARDEN

ACCORDING to the twenty-ninth annual report of the Brooklyn Botanic Garden, for 1939, more than 1,789,000 visitors were registered, an increase of nearly 72,000 over 1938. The attendance at classes and lectures for adults and children exceeded 104,000. Teaching material was supplied to more than 4,700 teachers in all five boroughs of Greater New York for the instruction of over 281,700 pupils.

Research has been continued on the problem of disease resistance in plants; the culture, diseases and nomenclature of Japanese Iris; the fungus disease (*Endothia parasitica*) of the American chestnut, and on the native and foreign flora.

The library, with more than 37,600 bound volumes and pamphlets, is open free to the public daily, and had nearly 5,000 readers during 1939. The opening paragraphs of the report congratulate American educational and scientific institutions on being located in a country where scientific investigators and teachers are free to pursue the truth as it is, and to proclaim it without necessity of having to try to bring it into conformity with any political or sociological or racial ideology.

More than half the operating budget for the year (51.82 per cent.) was provided from private funds, the remainder (48.18 per cent.) being appropriated in the tax budget of New York City. Private citizens contributed to the support of the garden more than $54,000, which equals nearly 57 per cent. of the tax budget appropriation ($96,450). "Private benefac-

ons," the report points out, "are derived from surplus of income or capital, but in these days it seems to be the deliberate intention of government to abolish surplus by excessive taxation. It is like planning to get water for irrigation, or power to generate electricity, by draining the great federal dams." The need of a substantial increase in the permanent endowment funds is emphasized.

EXPEDITIONS OF THE SMITHSONIAN INSTITUTION

REPORTS of nineteen expeditions, extending from Mexico to Siberia and from Peru to north Greenland, of the Smithsonian Institution during the past year are published in the recently issued annual Explorations Report. The expeditions were for the purpose of both gathering specimens of plants, animals, minerals and fossils for the national collections and for field study of scientific problems.

Dr. W. F. Foshag collected minerals in the mining districts of Mexico, particularly at the Ojuela mines in Durango, where a single mine is reported to contain more than 200 miles of tunnels. A hunt for dinosaurs and extinct mammals was conducted by Dr. C. Lewis Gazin in central Utah. Dr. William M. Mann, director of the National Zoological Park, describes his adventures in bringing a cargo of living animals from the Argentine. Among his specimens were some not previously seen in this country. Dr. Alexander Wetmore (assistant secretary of the institution, collected birds in southern Mexico. Dr. Leonard P. Schultz, curator of fishes, accompanied a U. S. Navy expedition to the Phoenix and Samoan Islands. He collected approximately 90 varieties of fish from a lagoon in the center of the coral-built Canton Island. Among these was a type of trumpet fish extremely rare in collections. Eleven days on Rose Atoll, another coral-built island of the Phoenix group, resulted in the capture of a hundred varieties of fishes, besides corals, mollusks, invertebrates and many birds. In a single day on another atoll, Tau Island, he obtained 800 fishes belonging to 90 different species.

Dr. Waldo L. Schmitt, curator of marine invertebrates, describes his collecting activities along the northern coast of South America as a member of the G. Allen Hancock 1939 expedition. Many specimens were collected on the island of Tobago, the locale of Robinson Crusoe.

Specimens of marine life were collected in Arctic waters by Captain Robert A. Bartlett. The collection included five specimens of the very rare 10-armed starfish. Only five specimens hitherto had been known, all in European museums.

A large collection of the flora of Colombia was made by Ellsworth P. Killip, associate curator of plants. His expedition covered especially the little-explored Pacific littoral, including the western slope of the Cordilleras. Mr. Killip also spent three weeks in the interior of the Choco, the forested region extending to the Panama border of Colombia. Altogether more than 11,000 specimens were collected.

Dr. Aleš Hrdlička, curator of physical anthropology, spent the summer examining specimens in anthropological museums in Russia and Siberia and in examining archeological sites.

In addition to these voyages outside the limits of the United States, there were several archeological and collecting expeditions in this country. Notable among those was that of Dr. Frank H. H. Roberts, Jr., who sought for remains of the earliest known inhabitants of North America in Colorado. Another project carried out by Dr. T. D. Stewart was the excavation of a Potomac River town closely associated with the life of Pocahontas.

RESEARCH GRANTS OF THE AMERICAN COLLEGE OF DENTISTS

THE Research Fellowship Board of the American College of Dentists has made the following grants for the year 1940–41.

$100 to H. R. Hunt and C. A. Hoppert, Michigan State College, to continue a study on "Inheritance in Rat Caries."

$500 to Albert H. Kniesner, Dental School, Western Reserve University, to conduct an investigation of "The Factors in Saliva which Influence the Growth of *L. acidophilus* and are Indicative of the Presence or Absence of Dental Caries."

$1,200 to Sidney B. Finn, School of Medicine and Dentistry, University of Rochester, for an investigation of "The Effect of Applications of Sodium Fluoride in Preventing and Controlling Dental Caries in Children."

$500 to Samuel Seltzer, Dental School, University of Pennsylvania, for "An Investigation of the Anti-Bacterial Action of Drugs which have been Recommended for Cavity Sterilization."

$400 to M. L. Tainter, of the School of Dentistry, College of Physicians and Surgeons, San Francisco, for an "Investigation of the General Problems Involved in the Evaluation of the Abrasiveness of Dentifrices and their Individual Constituents."

$500 to James Nuckolls, School of Dentistry, University of California, for an "Investigation of the Primary Centers of Lobular Development, Growth and Calcification in the Tooth."

$500 to Balint Orban, School of Dentistry, Northwestern University, to continue an investigation of "Wound Healing after Different Methods of Gingivectomy and Postoperative Treatment."

$100 to William J. Furuta, School of Dentistry, University of California, for a "Histologic Study of the Effect of Various Mineral Deficiencies on Dental and Oral Structures in Animals."

ANNUAL MEETINGS OF THE MINNESOTA AND SOUTH CAROLINA ACADEMIES OF SCIENCE

THE reorganized Minnesota Academy of Science held its eighth annual meeting at the University of Minnesota on April 19 and 20, with an attendance of five hundred. On Friday evening there was a banquet and a public lecture. Dr. A. J. Carlson, professor of physiology at the University of Chicago, spoke on "The Physiology of Aging." The meeting of the Junior Academy of Science was held at the same time and a program was presented by the members of the various science clubs. Officers of the academy for the coming year include:

President, J. W. Buchta, University of Minnesota.

Vice-president, Sister Antonius Kennelly, College of St. Catharine.

Secretary-Treasurer, H. K. Wilson, University of Minnesota.

Councilors, H. E. Essex, Mayo Foundation; E. T. Tufte, St. Olaf College; L. M. Gould, Carleton College, and C. O. Rost, University of Minnesota.

The South Carolina Academy of Science held its annual meeting at Furman University, Greenville, on April 20. At the business meeting the following officers were elected: *President,* John R. Sampey, Jr.; *Vice-president,* F. W. Kinard; *Secretary-Treasurer,* G. G. Naudain; *Curator,* J. E. Copenhaver; *Representative to the American Association for the Advancement of Science,* Gilbeart H. Collings; *Executive Committeemen,* E. B. Chamberlain, D. C. Agnew, W. E. Hoy, Robert B. Taft and H. L. Hunter. The program consisted of thirty-five papers. Approximately three hundred and fifty members and visitors attended. The academy meets at the University of South Carolina next year.

IN MEMORY OF ELIZABETH GERTRUDE KNIGHT BRITTON

IN a ceremony accompanied by an all-day program at the New York Botanical Garden on May 9, a bronze plaque was unveiled to the memory of Elizabeth Gertrude Knight Britton, wife of the first director-in-chief of the garden, Dr. Nathaniel Lord Britton. Mrs. Britton was a pioneer in the movement for the protection of wild flowers. The New York Bird and Tree Club presented a sum of money to the garden to be known as the Elizabeth Gertrude Knight Britton Fund for the purpose of furthering interest in the study and protection of wild flowers and the maintenance of a Wild Flower Sanctuary at the Botanical Garden.

The plaque will be placed in the southeastern portion of the Thompson Memorial Rock Garden, where for the past several years the native plants of the region have been collected for the establishment of a wild flower garden.

The program was concerned with wild flowers and their protection. The four addresses in the morning dealt with the protection and preservation of wild flowers by education, legislation and by raising them in the garden from seed. P. L. Ricker, of Washington, D. C., president of the Wild Flower Preservation Society, opened the program with an address on "Methods and Aims in Protecting Wild Flowers." Other speakers of the morning session were Dr. E. L. Palmer, of Cornell University; Robert S. Lemmon, editor of *Real Gardening,* and Mrs. Alfred Roelker, representing the Conservation Committee of the Garden Club of America.

Herman Forster opened the afternoon's program with a brief talk in appreciation of the things of nature, entitled "Wild Flowers—To-day and To-morrow." He was followed by Dr. C. Stuart Gager, director of the Brooklyn Botanic Garden, and by Dr. J. H. Barnhart, of the New York Botanical Garden, who gave reminiscences of Mrs. Britton, and by Dr. Clyde Fisher, of the Hayden Planetarium, who, as president of the New York Bird and Tree Club, presented the Elizabeth Gertrude Britton Fund to the New York Botanical Garden. It was accepted by Henry de Forest Baldwin, vice-president of the garden.

After the unveiling and dedication of the plaque, tea was served by the New York Bird and Tree Club.

RECENT DEATHS AND MEMORIALS

DR. EDWIN FITCH NORTHRUP, since 1920 vice-president and technical adviser of the Ajax Electrothermic Corporation of Trenton, N. J., previously for ten years assistant professor of physics at Princeton University, died on April 29 at the age of seventy-four years.

DR. W. A. BRYAN, professor of clinical surgery at the Medical School of Vanderbilt University, died suddenly on April 30 at the age of sixty-six years.

DR. ADRIAN JOHN PIETERS, head of the Division of Forest Crops and Diseases, in charge of Lespedeza investigations, in the Bureau of Plant Industry of the U. S. Department of Agriculture, with which he had been connected since 1895, died on April 25 in his seventy-fourth year.

DR. ALFRED HANS WARING CAULFEILD, research member of the Connaught Laboratories of Toronto, died on May 2. He was fifty-nine years old.

ACCORDING to *Nature,* the Polish Government Information Department has issued a communiqué stating that up till February 1 the following professors, among others, of Polish universities have died in the concentration camp Sachsenhausen-Oranienburg, or have died since their release from camp: Tadeusz Grabowski, philosophy; Antoni Hoborski, mathematics; Kazimierz Kostanecki, comparative anatomy; Jan Nowak, geology; Feliks Rogoziński, physiology;

Adam Różański, agricultural mechanics; Michał Siedlecki, biology; Jerzy Smoleński, geography; Władysław Takliński, technology; Antoni Wilk, astronomy, and Jan Włodek, agriculture.

ESTABLISHMENT of a permanent research fellowship in zoology at Duke University has been made possible by a bequest in the will of the late Dr. Charles Wesley Hargitt, who until his death in 1927 was head of the department of zoology at Syracuse University and for thirty-six years a member of the faculty. The bequest, constituting half the residuary estate of Dr. Hargitt, did not become operative until after the death of Mrs. Hargitt. The bequest will provide a memorial research fellowship in zoology devoted to the promotion of research in cytology, to be known as The Charles W. Hargitt research fellowship in zoology.

IT is planned to erect a tomb memorializing Guglielmo Marconi on the grounds of the family villa Pontecchio, near Bologna, where he carried out his first experiments in wireless telegraphy. A wide-open space surrounded with cypress and fir will be laid out on the sloping ground below the villa. Plans call for an open crypt in the center containing the sarcophagus. A bust of Marconi will stand on a low column in front of the colonnaded entrance to the villa. It is expected that the monument will be completed by July 20, the second anniversary of Marconi's death. The villa will become a museum for relics of his work.

SCIENTIFIC NOTES AND NEWS

AT the dinner meeting on May 24 of the Chicago Section of the American Chemical Society the Willard Gibbs Medal for 1940 will be presented to Dr. Vladimir N. Ipatieff, director of chemical research of Universal Oil Products Company and professor of chemistry emeritus at Northwestern University. The presentation will be made by Professor S. C. Lind, of the University of Minnesota, president of the society. An account of Dr. Ipatieff's work, by Dr. Cary R. Wagner, chairman of the medal jury, is given on page 486 of the issue of SCIENCE for November 24.

THE medal of the American Institute of Chemists, awarded annually for "outstanding service to the science of chemistry and the profession of chemist in America," will be presented to Dr. Gustav Egloff, director of research of the Universal Oil Products Company, Chicago, at the annual meeting to be held on May 18 in Atlantic City. Dr. Egloff has developed a number of processes for refining and treating crude oils and has been granted over 250 patents on the processing of oil, coal and chemical derivatives of hydrocarbons.

DR. WILLIAM MARTIN SMALLWOOD, head of the department of zoology in the College of Liberal Arts of Syracuse University, was honored by his colleagues in the faculty of natural science on April 30, when his portrait, painted by Joseph Koslawski, a graduate of the university in 1936, was presented to the university. The presentation was made by Professor Henry Jones, and Chancellor William P. Graham accepted the portrait for the university. It was hung in the Smallwood Science Library in the Lyman Hall of Natural Science.

DR. HARLOW SHAPLEY, Paine professor of astronomy and director of the Harvard College Observatory, has been elected an honorary member of the Harvard class of 1910, in which year he received the degree of bachelor of arts from the University of Missouri.

DEAN EMERITUS CARL E. SEASHORE, of the department of psychology at the State University of Iowa, has been elected an honorary member of the British Psychological Society.

DR. WARREN F. DRAPER, of the U. S. Public Health Service, has been elected president of the Academy of Medicine of Washington, D. C., for 1940 and 1941.

PROFESSOR HANS A. BETHE, of Cornell University, has been appointed visiting professor of physics at Columbia University for the next academic year.

PROFESSOR PETER DEBYE, director of the Kaiser Wilhelm Institute for Physics at Berlin, who is now Baker lecturer at Cornell University, will be guest lecturer from June 19 to July 12 in the department of chemistry of the University of Chicago. He will give two series of lectures on "The Structure of Molecules and of Liquids from the Point of View of Interference Phenomena."

DR. ARTHUR H. COMPTON, professor of physics at the University of Chicago, has been appointed dean of the physical sciences. He will succeed on July 1 Dr. Henry Gordon Gale, who has served since 1925 as chairman of the department. Dr. Gale will become dean emeritus of the physical sciences.

PROFESSOR GEORGE H. SABINE, professor of philosophy at Cornell University, has been named dean of the Graduate School. He succeeds Dr. B. S. Monroe, who has served as acting dean since the death of Dr. F. K. Richtmyer.

DUE to age regulations, Professor Robert B. Wylie will be relieved of administrative work at the State University of Iowa with the close of the present semester. He will continue on part-time basis as professor of plant morphology. His successor as chairman of the department of botany will be Professor Walter F. Loehwing, who has been since 1925 in charge

of plant physiology and will continue the work of the professorship.

DR. EMORY L. CHAFFEE, Gordon McKay professor of physics and of communication engineering at Harvard University, will become director of the Cruft Memorial Laboratory in September.

DR. ROBERT SHERWOOD SHANKLAND, associate professor of physics at the Case School of Applied Science, who has been acting head of the department since 1939, has been made permanent head.

THE Josiah Macy Jr. Foundation has granted $4,500 to Cornell University to be used by the department of psychology in the continued support of the investigations on experimental neuroses, under the direction of Dr. Howard S. Liddell.

JOHN WILLIAM HARRISON, preparator in the department of anthropology of the Field Museum, Chicago, retired from active service on April 30.

DR. CHARLES A. LORY, president of the Colorado State Agricultural College since 1909, has been appointed a member of the Land Committee of the National Resources Planning Board. Members of the committee include Dr. Carl L. Alsberg, director of the Giannini Foundation of the University of California; Dr. Charles C. Colby, professor of geography, University of Chicago; Lee D. Muck, director of the Forestry Division, Department of the Interior; Dr. William I. Myers, chairman of the department of agricultural and farm management, Cornell University; Dr. H. R. Tolley, chief of the Bureau of Agricultural Economics, Department of Agriculture, and Dr. George S. Wehrwein, professor of agricultural economics, Cornell University.

THE Field Museum reports that having completed his work in the region of the Straits of Magellan, including the island of Tierra del Fuego, Dr. Wilfred H. Osgood, chief curator of the department of zoology, leader of the expedition, has returned to Chicago. Other members of the expedition who have returned are Karl P. Schmidt, curator of amphibians and reptiles, and John Schmidt, field assistant. Colin C. Sanborn, curator of mammals, is remaining in the field to continue work in certain parts of Argentina and Peru.

THE Edgar Fahs Smith Memorial Lecture of the University of Pennsylvania will be given on the evening of May 24 by Dr. Per K. Frolich, director of the Chemical Division of the Esso Laboratories of the Standard Oil Development Company. His subject will be "Our Changing Concept of Aliphatic Hydrocarbon Chemistry."

DR. R. J. ANDERSON, professor of chemistry at Yale University, will deliver the eighth and last Harvey Society Lecture of the current series at the New York Academy of Medicine on May 16. He will speak on "The Chemical Composition of the Lipoids of the Tubercle Bacillus."

DR. E. V. MCCOLLUM, professor of biochemistry at the School of Hygiene and Public Health of the Johns Hopkins University, delivered the annual lecture for the University of Alabama Chapter of Sigma Xi on April 17. His subject was "The Diet in Relation to Dental Disease."

DR. HARRY N. HOLMES, of Oberlin College, lectured at the University of Tennessee on April 12 and 13 in the series given annually under the auspices of the Alpha Phi Chapter of Alpha Chi Sigma. Titles of the individual lectures were "Vitamin Research," "Research Methods in Chemistry" and "Adsorption Column Separation."

THE Cavanee Lectures in neuro-psychiatry were delivered on April 8, 9 and 10 at the University of Southern California by Dr. Franklin G. Ebaugh, of the University of Colorado.

DR. G. H. PARKER, professor of zoology, emeritus, of Harvard University, lectured on April 26 on "An Operational Aspect of Natural Selection" before the Phi Sigma Chapter of Duke University.

PROFESSOR DOUGLAS JOHNSON, of Columbia University, delivered the annual Sigma Xi address of the University of Michigan chapter on April 24, taking as his subject "The Mysterious Craters of the Carolina Coast: A Study in Methods of Research." The following day he addressed members of the departments of geology and geography on "Geology and Strategy in the Present War." On April 18 he spoke before the Geological Society of Philadelphia on the latter topic.

DR. SVERRE PETTERSSEN, formerly chief of the Western Norway Weather Bureau, who recently was made professor of meteorology at the Massachusetts Institute of Technology, will deliver the Wright Brothers lecture at Columbia University on December 17, the thirty-seventh anniversary of the Wright Brothers' first flight in a power-driven heavier-than-air craft. The Wright Brothers lecture has an endowment of $17,000 provided by Edmund C. Lynch in 1938, in memory of his brother, Vernon C. Lynch. The selection of the lecturer is made by a committee composed of Americans who have delivered the Wilbur Wright Memorial lecture before the Royal Aeronautical Society in London.

DR. S. S. GOLDWATER, commissioner of the Department of Hospitals of the City of New York, has announced that the department is in need of a medical administrator to serve as deputy commissioner. The department spends annually approximately $30,000,-

000, conducts 30 institutions, cares for approximately 700,000 patients a year and commands a personnel numbering 28,000 professional and non-professional workers, paid and unpaid. The deputy commissioner is exempt under the charter from competitive Civil Service; citizenship and three years' residence in New York are required.

FOR the first time in the history of the American Society of Mechanical Engineers, the 1940 semi-annual meeting will be held in three cities, with simultaneous meetings taking place in Milwaukee, at the Hotel Pfister from June 17 to 20; at the University of Michigan from June 20 to 21, and at Asbury Park, N. J., at the Berkeley-Carteret Hotel from June 19 to 22. Erik Oberg is chairman of the meetings and of the program committee. At the main meeting in Milwaukee there will be thirteen technical sessions with thirty papers covering hydraulics, steam power, education and training, management, fuels, machine-shop practice, process industries and railroads, several plant trips, luncheons, a business meeting and a banquet. The meeting at Ann Arbor, under the sponsorship of the Division of Applied Mechanics, will present four technical sessions, devoted to elasticity, dynamics, fluid mechanics and thermodynamics, with thirteen papers by some of the outstanding engineering theorists of the country. Besides an exhibit of Diesel engines and accessories, the Division of Oil and Gas Power, in Asbury Park, will include six sessions with twelve technical papers on the subjects of Diesel-engine fuels, shaft couplings, marine Diesels, and engine design, operation and maintenance.

A SPECIAL committee of the Research Council on Problems of Alcohol, of which Dr. Merrill Moore, of the Washington Hospital, Boston, is chairman, is preparing a three-day program for a symposium on alcoholism to be conducted at Philadelphia in connection with the annual meeting in December, 1940, of the American Association for the Advancement of Science. This symposium, if approved by the Executive Committee of the association, will be held under the auspices of the medical section. There will be six sessions. The Surgeon General of the U. S. Public Health Service will be among the speakers.

THE annual meeting of the members and trustees of the National Parks Association was held in the Cosmos Club, Washington, D. C., on May 9. There was an anniversary dinner in the evening at which, according to the program, William P. Wharton, presided, and Dr. Henry Baldwin Ward, vice-president, acted as toastmaster. The speakers and their subjects were Dr. Wallace W. Atwood, president of Clark University, "Protection of Nature in the Americas"; Dr. John C. Merriam, president emeritus, of the Carnegie Institution of Washington, "The Human Values of Parks," and Newton B. Drury, secretary of Save-the-Redwoods League, "Preservation of the Natural Landscape." Motion pictures in natural color on "Wildlife of the Arctic Wilderness," Mount McKinley National Park, were presented by Victor H. Cahalane, of the Section on National Park Wildlife of the U. S. Biological Survey.

THE trustees of Oberlin College at a special meeting on April 27 "appropriated $100,000 from free current assets for the making of necessary repairs, and set aside $900,000 from the same source as a building fund." The committee on location, plans and construction of college buildings was directed to have plans prepared for an addition to the Carnegie Library and for a new heating plant, and to take steps preliminary to the preparation of plans for a physics building and a biology building, to be units of the proposed science quadrangle, and a residence for men.

BY the will of Mrs. William R. Shepherd, wife of the late Professor Shepherd of Columbia University, who died on January 22, Dr. Stephen P. Duggan, director of the Institute of International Education, is appointed as one of the executors of the estate. This is estimated to be of the value of $140,000, the interest on which is to be given to a sister during her lifetime. At her decease the fund is to be inherited by the Institute of International Education, the interest to provide fellowships for European students in the colleges and universities of the United States.

DR. ALBERT R. MANN, formerly provost of Cornell University, now vice-president of the Rockefeller Foundation, and Mrs. Mann have given their former residence at Dryden Road, Ithaca, to the university. Net rentals will be added to the proceeds of the sale of the property and the resulting capital fund will be permitted to accumulate interest until it reaches $15,000. The income from this fund will be devoted to the purchase of books of biological interest.

DISCUSSION

PACIFIC SALMON NOT ESTABLISHED IN ATLANTIC WATERS

THE great variety (five species) of salmon of the genus *Oncorhynchus* in the streams of the Pacific coast of this continent, has from the early days of fish culture stimulated the desire to establish at least some of them in the streams of the Atlantic coast, and various attempts have been made, beginning as far back as 1872. Davidson and Hutchinson[1] in reviewing attempts to transplant Pacific salmon to other than their

[1] F. A. Davidson and S. J. Hutchinson, *Bull. U. S. Bur. Fisheries*, 48: 671, 1938.

native waters consider that pink salmon (*O. gorbuscha*) were established in Maine waters and chinook salmon (*O. tschawytscha*) in waters in New Brunswick and Ontario, and this is being quoted, as by Needham.[2]

Dymond, Hart and Pritchard,[3] whom Davidson and Hutchinson cite as their authority for the chinook salmon, do not mention New Brunswick, and for Ontario report lack of knowledge of any individuals of a second generation, although there was unquestionable survival of some of the planted fish to the adult state. The plantings were made in streams of Lake Ontario, the last in 1925, and recent inquiry reveals that the species is now unknown in these waters. Davidson and Hutchinson's reference to chinook salmon in the St. John River of New Brunswick evidently refers to plantings made in 1881 and 1882. The reports of their success[4] were by hatchery officers who failed to furnish specimens for examination and circumstances that need not be detailed here, seem to justify the inference that the fish seen were merely the native Atlantic salmon. There has been no knowledge of any other salmon in this river or in the Bay of Fundy outside its mouth than the native species until 1939, when a peculiar salmon was reported as taken (July 22) in the bay about eight miles from the river mouth. This was carefully examined and proved to be a chinook salmon. Two other specimens were reported later, but were not available for examination. These records have no validity as proof of the establishment of the species, since numerous plantings of chinook salmon have been made in recent years in the neighboring states of Maine and New Hampshire, as I am informed by G. H. Stobie, commissioner, and Prof. H. E. Warfel, State Biologist, respectively. For the plantings in the waters of Maine, Mr. Stobie states (letter of December 27, 1939), "we do not have clear evidence that the second generation of chinook salmon has resulted." Scales of individuals taken in Lake Ontario and in the Bay of Fundy, which have been available to us for examination, show abrupt change from slow to rapid growth in the latter, but not in the former, justifying the conclusion for the former that these salmon did not descend to the ocean, but remained in Lake Ontario, as seems to have been true for the native Atlantic salmon,[5] which disappeared from the lake many years ago.

The United Staes Bureau of Fisheries planted thousands of pink salmon fry annually in streams in Maine from 1906 to 1908,[6] but apparently without result. Then from 1914 to 1918 it planted millions of fry annually. Runs of adults appeared in certain rivers beginning with those from the planting of 1914, and they were largest in the Dennys and Pembroke Rivers (in 1917 at least 2000 fish in the former and 500 in the latter),[7] which empty into Cobscook Bay. The reason may be that the best feeding of the whole coast is to be found in that bay, as shown by the small herring (sardines) being fatter there than elsewhere.[8] The species has a life history of exactly two years from spawning to spawning and it is usual in its native streams for runs to occur only every other year, either even or odd, as if one successful year class eliminates the following one, and so leaves the field clear for its own offspring. In spite of increasingly larger numbers of fry being planted in Dennys River (from 225,000 in 1914 to 1,050,000 in 1917), the reports are only of runs every other year beginning with that in 1915, the outcome of the planting of 1914.[9] Similarly, a thorough attempt (1931 and 1935) to establish a run of this salmon in the "off" year in a stream in British Columbia, in which it occurred naturally, utterly failed.[10] Beginning in 1919, the transfer of eggs from the Pacific coast was stopped and eggs, taken from the fish ascending the Dennys and Pembroke Rivers, were hatched and the fry planted the next year. The runs and the artificial handling of the eggs continued every other year until 1925.[11] The Bureau of Fisheries states (letter from Mr. John R. Gardner, acting commissioner, February 1, 1940) that for 1927 "run of fish reported—no eggs taken" and that "no adequate information available relative to succeeding runs but the species is now reported as non-existent in the Dennys River or other Maine waters." The Bureau of Fisheries also states (letter from Chas. E. Jackson, acting commissioner, October 24, 1939) that the disappearance of the fish has been "due to the absence of any attempt to conserve the run and the presence of dams which apparently eliminated natural reproduction." The facts show that the pink salmon will pass successfully through its sea stage on certain parts of the Maine coast, but evidence fails of there having been a second generation produced by natural spawning.

The available facts are consistent with the view that wherever Pacific salmon have been planted in waters of the Atlantic coast they persisted no longer than would be expected from the known length of life for individual fish. Without natural completion of the life cycle there can not properly be said to be any establishment of Pacific salmon in Atlantic waters. To

[2] P. R. Needham, "Trout Streams," p. 15. 1938.
[3] J. R. Dymond, J. L. Hart and A. L. Pritchard, *Univ. Toronto Stud. Biol. Ser.*, 33: 15, 1929.
[4] "Report Fish-Breed. Dom. Can.," 1885: 28, 1886; 1893: 335, 1894.
[5] A. A. Blair, *Copeia*, 1938 (4): 206, 1938.
[6] Report Comm. Fisheries, 1906; 1907; 1908.
[7] Report Comm. Fisheries, 1918: 16.
[8] H. I. Battle, *et al.*, *Jour. Fisheries Res. Board Can.*, 2: 403, 1936.
[9] Report Comm. Fisher., 1916: 30; 1917; 1918: 16; 1919; 1920: 49.
[10] A. L. Pritchard, *Jour. Fisheries Res. Board Can.*, 4: 149, 1938.
[11] Prop. Dist. Food Fishes, App. Report Comm. Fisher., 1922: 56; 1924; 409; 1926: 359.

attain success it would seem desirable (1) to study carefully the factors limiting the survival of a particular species of Pacific salmon, (2) to select an Atlantic stream furnishing the most suitable conditions and (3) to concentrate on that stream attempts at transplanation of the species, closely following the outcome.

A. G. HUNTSMAN
J. R. DYMOND
FISHERIES RESEARCH BOARD OF CANADA AND
UNIVERSITY OF TORONTO

GLAUCONITE PSEUDOMORPHS AFTER OPHIURAN PLATES

MUCH has been written as to the origin of glauconite and it is not the author's intention to discuss the validity of these writings or to propose a new theory, but rather to record a new form in which this mineral is found.

The material which contained this glauconite is part of a collection made through the use of a grant from the American Academy of Arts and Sciences. The material was collected by the author on December 28, 1938 in a small stream valley just south of State Route number 44 at a point 3.3 miles east of Grove Hill, Clarke Co., Ala. The exposure consisted of a hard grayish clay which contained a number of *Scutella* sp. and large shark teeth. The age is Upper Eocene, Jackson formation. The author is also intebted to the Marsh Fund of the National Academy of Sciences for a grant which was used in washing and separating this and other Tertiary samples, from the Coastal Plain. The material upon washing proved to contain a great number of disarticulated Ophiuran plates, a great deal of glauconite and some foraminifera. The glauconite was removed from the calcareous material by an electric magnet, and from the former the pseudomorphs were picked by hand.

These pseudomorphs are of a slightly lighter shade of green than the rest of the associated glauconite grains. Their surface is smooth and not foliated or botryoidal as is customary, there being, however, several instances where the surface is cracked. Only pseudomorphs after the lateral arm plates of the Ophiurans were found preserved in this condition. None of the other twenty odd different types of plates was apparently affected or if they were their original shape had been so altered as to be unrecognizable. The lateral arm plates are much thicker than the majority of other plates and also a great deal more numerous. There are 3,682 of one type of lateral arm plate from this locality, which do not show any alteration, indicating that this type of preservation is rare and confined to the most common of all the plates.

The present-day accepted theory as to the origin of glauconite is that it is an alteration of biotite under certain conditions. Undoubtedly this is true in most cases for the foliated structure of many of the glauconite grains clearly shows this affinity. But does this theory hold for all grains of glauconite? When biotite alters to glauconite there is an expansion which takes place perpendicularly to the biotite cleavage.[1] If such expansion had taken place in these Ophiuran plates why were not their original shapes and proportions distorted? However, in no case was there any evidence of such distortion. This lack of foliation and accompanying distortion seems to indicate a somewhat different origin for the glauconite pseudomorphs in this individual case.

In order to see if the original reticulate structure of the Ophiuran plates had been retained after alteration several sections were ground and these sections showed that the original structure had been retained.

The material from this one locality in Alabama is the only instance which the author has observed where Ophiuran plates were replaced by glauconite. The identification of these lateral arm plates has not been worked out as yet beyond the fact that they belong to the genus Ophiura.

CHARLES T. BERRY
THE JOHNS HOPKINS UNIVERSITY

BOG LEVELS[1]

ALTHOUGH it is well known that there is fluctuation in the levels at the edge of bog mats, finding the forested bog mat riding the crest of seasonal waves appears quite intriguing to the author and seems to be worthy of notation.

For a number of years ecological work has been carried on in the Mud Lake Bog in Cheboygan County in northern lower Michigan. In 1922 this work included the determining of the profile of the bottom of the bog. Underneath the forested mat east of the lake, a considerable area of the sandy bottom was flat and equidistant (10.5 feet) from the surface. In subsequent years, determinations of the depth to the sandy bottom were made in the same part of this area. Previous to 1928 the layers to sand included the mat (Sphagnum and Chamaedaphne growing among *Picea mariana*, black spruce), below which was a layer of disintegrating plant parts, and below this a layer of brown peat, becoming firmer and blacker as the borer went lower. From 4 to 6 inches of blue clay filled with shells of Pleistocene age rested on the flat sand bottom.

Up through 1927 borings on this area gave the same depth to bottom. In 1928, however, following unprecedented heavy snow, it was discovered that it was a greater distance to the sandy layer than had previously

[1] E. W. Galliher, *Geol. Soc. Amer. Bull.*, 46: 1356, 1939.
[1] Contribution No. 402, Department of Botany and Plant Pathology, Kansas State College, Manhattan, Kansas and U. of Mich. Biological Sta.

been recorded and that below the upper brown peat was a wetter, soupier peat. The forest-covered mat had risen a foot and a half from the previous year. Up to this time evidence pointed to the normal development that is to be expected in the filling in of northern bog lakes in their conversion to land. With the breaking loose of the mat and the insertion of what might be called an unconformity, the tree-covered mat has now shown fluctuations from year to year, the measurements being made with the same instruments within 5 feet of the same place each year and at about the same time late in July. These figures, as expressed in Table 1, have shown a rise of the tree-covered mat as much as 2.2 feet above the datum established in 1922 and although accompanied by lower stages have so far never reached the low level known before 1928.

TABLE 1

DEPTH FROM SURFACE OF SPHAGNUM TO SAND BOTTOM AT THE SAME PLACE ON THE MAT AT MUD LAKE BOG

Year	Feet	Year	Feet
1922	10.5	1931	11.0
1923	10.5	1932	11.0
1924	10.5	1933	11.7
1925	10.5	1934	11.5
1926	10.5	1935	11.8
1927	10.5	1936	11.25
1928	11.5	1937	11.5
1929	12.0	1938	12.7
1930	11.5	1939	12.3

If pollen percentage profiles are made in fluctuating parts of such bogs comparable measurement of depth is another problem to consider.

FRANK C. GATES

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MANHATTAN

HURRICANE INTELLIGENCE

A VERY unusual phenomenon in the field of mental testing was observed at the Massachusetts State College, Amherst, Mass., during the hurricane of September 21, 1938. In accordance with previous scheduling, a mental test was administered to the freshman class during the major part of the storm. In spite of very poor illumination (due to failure of electricity), falling trees and the characteristic weirdness both of sound and vision which prevailed, the freshmen showed a 20 per cent. superiority over the previous ten-year average. Other tests administered to the same freshmen show this class to be about average. This marked superiority under what would appear to be very adverse conditions has attracted much attention. Coincidence and chance do not appear to adequately explain these results. When all conceivable factors are considered, it appears plausible that the unusual amount of ozone in the air during the hurricane served as a mental stimulant to the freshmen. Authority for asserting the presence of relatively large quantities of ozone during the hurricane is expressed in a note in SCIENCE of November 24, 1939, by Dr. C. A. Peters.

H. N. GLICK

MASSACHUSETTS STATE COLLEGE

LUNAR RAINBOWS IN HONOLULU

I DO not know if readers of SCIENCE want to hear any more about rainbows in Honolulu, but I spent my boyhood there and can still remember the glorious sight of the lunar rainbows. I remember once seeing a double one. I think the reason why one sees such brilliant rainbows, especially on Oahu, is that several times a day a squall of rain is likely to originate in the cloud cap over the Koolau range and to travel southward down one of the valleys. While the mountain range that runs from east to west throughout the island is covered with a black cloud, a few miles out at sea the sun is shining brilliantly. There are no clouds there. Obviously, the conditions are ideal for the frequent formation of unusually beautiful rainbows.

WALTER ALVAREZ

THE MAYO CLINIC,
ROCHESTER, MINN.

SCIENTIFIC BOOKS

ANOTHER INVENTOR OF THE CALCULUS?

James Gregory, Tercentenary Memorial Volume. Edited by HERBERT WESTERN TURNBULL, F.R.S. vii + 524 pp. London, 1939.

THE subtitle to this handsome memorial explains that the volume contains Gregory's "correspondence with John Collins and his hitherto unpublished mathematical manuscripts, together with his addresses and essays, communicated to the Royal Society of Edinburgh, July 4, 1938." James Gregory (1638–1675) is probably the most justly celebrated of nineteen notable members of a famous Scotch family whose ability persisted through several generations, in mathematics and in medicine. The nauseous, gritty mess known as "Gregory's mixture" or "Gregory's powder," was perpetrated by one of the medical Gregorys; and for all the reviewer knows to the contrary, it may still be inflicted on helpless bairns.

The hero of the present memorial was a mathematician. His short life fell in one of the major epochs of mathematical history; and had he been nearer the center of things, James Gregory might have left a far greater name than he has. Before beginning his bleak professorship at the University of St. Andrews in 1668, Gregory had profited by four years on the Continent, mostly in Italy, where he seems to have absorbed

some of Cavalieri's pernicious nonsense about "indivisibles," which Newton had the mathematical insight to reject. Scotland in the seventeenth century was not exactly the locale an original mathematician would have chosen in which to develop his natural gifts. The story of Gregory's life, with many sidelights on the famous mathematicians and scientists of his day, has been woven into the science and mathematics with great skill by Professor Turnbull.

Assuming some familiarity with the history of mathematics in 1638–1675, we shall note presently only three of the many items on which Gregory's reputation as a mathematician now rests. Even this sample would require several times the available space for adequate evaluation. Professor Turnbull's translations of Gregory's Latin, and his illuminating "explanations" accompanying them, will enable any reader of the volume to reach his own conclusions as to what Gregory actually did, what he may be credited with on circumstantial evidence, and what he might have done had his material circumstances been more propitious than they were. Concerning the two possibilities mentioned, it is a reasonable guess that historians of mathematics will find, especially in the first, material enough to keep them busy conjecturing for the next hundred years. For example, since the Collins who slips in and out of Gregory's correspondence like a friendly eel was the same Collins who called himself a friend of Newton, there are implicit in this stimulating book at least fifty full-length monographs and as many Ph.D. dissertations in the history of mathematics on the single theme of "Did Newton Influence Gregory more than Gregory influenced Newton?" That unanswerable questions can not, in the nature of things, be answered, will not deter critical scholarship, which sometimes seems to experience neither weariness nor common sense.

Gregory's first and most sensational claim to remembrance in the history of mathematics is that he discovered what is traditionally called Taylor's theorem in the differential calculus over forty years before Taylor rediscovered it—as we must say, henceforth, if we admit the cogency of Professor Turnbull's extremely able presentation of Gregory's case. The evidence is indisputable; sixteen detailed exhibits substantiate a *circumstantial* proof that Gregory was many times guilty of using Taylor's and Maclaurin's theorems without once committing either to paper. Innocent men have been hanged for less.

Gregory is all but convicted on a single numerical slip. To quote Professor Turnbull (pp. 356–7): "One numerical error occurs in two of the series—the coefficient 3233, which should be 3968—otherwise the series are correct. But this is precisely the error which occurs [elsewhere, in a calculation of successive derivatives] due to the mistaken coefficient 987 at the sixth derivative. . . . The inference is irresistible that these series were derived directly from these notes: else how are we to account for the existence of this solitary error in two distinct contexts? . . . In contrast to his [Gregory's] interpolation formula, . . ., which he stated explicitly in general form, . . ., the Taylor series occurs only in applications." Surely this is enough to condemn the accused? But no; British justice is British justice, even in Scotland, if not in Ireland; and the Scotch Gregory very justly gets the Scotch verdict of 'not proven' to which alone the facts in the case entitle him: "The reader must judge for himself whether this constitutes a claim that Gregory had discovered Taylor's theorem; but if he rejects the claim he is faced with the puzzling question how to account for his wealth of applications of a complicated theorem if the theorem itself were unknown to Gregory."

Regarding the first question, we merely suggest that some scholar of the curious compile a select anthology of coincidences and mistakes in mathematics which might have led to retroactive anticipations as spectacular as Gregory's had they been sympathetically interpreted. The second question, how a man can make numerous applications of a complicated theorem (or of an elaborate algorithm) without suspecting the existence of the theorem (or the algorithm), arises frequently in the history of mathematics. To mention a possible instance on which competent opinion is divided, there is the controversy over Fermat's alleged invention of the differential calculus. A more interesting example, and one closer in character to Gregory's possible but unproved use of Taylor's theorem, appears in the history of trigonometric series from Euler and Lagrange to Fourier. Here the facts are clear; and in spite of circumstantial evidence of the most plausible kind, it is generally agreed that the predecessors of Fourier who seem to have applied his theorem had no inkling that any such theorem existed. Another anthology of such illusory anticipations, with selections from the more heated arguments pro and con, might be a useful *vade mecum* for future historians who, it may be expected, will prove conclusively (1) that Gregory anticipated Taylor, (2) that he did not.

There are already several such vacuous logomachies in the critical history of mathematics. Another example from Gregory's own prolific century is the dispute concerning Barrow's hypothetical influence on Newton in the development of the differential calculus, in which equally competent scholars[1] have reached

[1] For example, J. M. Child, "The Geometrical Lectures of Isaac Barrow." Chicago, 1916; F. Cajori, *American Math. Monthly*, 26: 15–20, 1919. See also A. Dresden, *Bulletin Amer. Math. Soc.*, 24: 454–7, 1918.

diametrically opposite conclusions. A third faction in this particular dispute would claim that Newton's own explicit statement of what led him to his method, not known when the controversy was at its hottest, has abolished the topic of debate. Gregory now (p. 13) enters the lists as a competitor for the honor of having invented the differential calculus: "These notes are the silent but unerring witness giving Gregory the right to take his place with Barrow, Newton and Leibnitz as a principal discoverer of the differential calculus." This may be so; it is only for historians to decide. In the important detail of Gregory's claim to Taylor's theorem, it would seem that until positive evidence is discovered, and there appears to be but a slim chance of this after Professor Turnbull's painstaking search, the field for inconclusive speculation is wide open for all who care to cultivate it.

Passing to the second item, we note that Gregory's quality as a mathematician appears unmistakably in his conjectures (in modern terminology) that the numbers π and e are transcendental, and in his suspicion that not all equations are solvable by radicals.[2] Although he had been anticipated by Omar Khayyam and Fibonacci in conjectures of the second of these species, there appears to be no question that Gregory was original in his doubts. This is mathematics of a far higher order than mere algoristic ingenuity. Gregory's own attempts to implement his doubts were abortive, not being aimed in the right direction.

The third and last item of Gregory's mathematics to be noted here is his work in diophantine analysis. The evidence in this instance is fairly complete that Gregory was acquainted with the conclusions and at least some of the methods, including Fermat's of infinite descent, of his immediate predecessors and contemporaries. As to the quality of Gregory's work in this field, naturally it is in the pre-Lagrangian tradition, which prevailed from Diophantus to Euler, of ingenious devices, incomplete solutions, and disregard of existence theorems. It was not until nearly a century after Gregory's death that Lagrange inaugurated (1766–69) the civilized era in diophantine analysis with his complete discussion of the so-called Pellian equation (Fermat's equation). For the continued sane development of diophantine analysis, it can not be too strongly emphasized that the tradition of Diophantus, Gregory and Euler belongs to a memorable but buried past, and that Lagrange was the first to elevate the subject above haphazard ingenuity to a mathematical discipline. Still hopelessly in the Dark Ages of diophantine analysis, Gregory nowhere gives any indication that he had grasped the nature of the real problem in the subject, that of devising a non-tentative method for exhibiting all numbers, and only those, satisfying a given equation. Before Lagrange, Legendre and Gauss confined their efforts to single equations of degree not higher than the second, little bearing any resemblance to reputable mathematics was accomplished in diophantine analysis. The absurdly difficult problems attacked by Lagrange's contemporaries and predecessors, including Gregory, are a testimonial to lack of insight rather than to daring originality. Gregory's last (1675) and in some respects most individual venture, his problem of cubes, is in this venerable tradition of ingenuity without insight.[3]

This meagre sample of Gregory's impressive work in mathematics must suffice here. For a vivid picture of the man himself, and of his equally notable achievements in other departments of mathematics and in the science of his times, we must refer to Professor Turnbull's full and documented account. We have tried only to suggest that this extremely interesting volume may supply historians of mathematics with much new fuel for their interminable controversies. Whether such disputes as are likely to be engendered by critical evaluations of Gregory's claims add anything worth having to human knowledge, is a matter of opinion. Whatever the final verdict is to be, it seems likely that James Gregory will remain as he is portrayed in this book, a mathematician whose reputation might have overshadowed that of many others who have long since passed into the traditional history of mathematics, had fortune been only a little kinder to him.

E. T. BELL

CALIFORNIA INSTITUTE OF TECHNOLOGY

REPORTS

SUMMER CONFERENCES AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

A SUMMER program of technical conferences and courses on research and practice on the frontiers of science and engineering has been announced by Professor Raymond D. Douglass, chairman of the summer session of the Massachusetts Institute of Technology. This program, which supplements the regu-

[2] There seems to be a slight confusion on p. 383, where it is stated that Tschirnhausen solved (1683) the quintic and sextic algebraically "when the second and third highest terms were absent," although the following sentence states (correctly) that "Abel demonstrated the impossibility of such a solution, in general, for the quintic and higher equations."

[3] Contrary to the statement in p. 435, it has not been proved that the problem is impossible. In addition to the cited note by Fauquembergue, the remarks by Tannery on the page following the note should be consulted. Fauquembergue's attempted proof of impossibility is unsound.

lar summer courses for undergraduate and graduate students, will include four important conferences and thirteen special advanced courses.

In announcing the program, Professor Douglass said that the conferences and special courses are planned primarily to meet the requirements of graduate engineers who wish to be brought up-to-date in the scientific and technical background of their professions. "This is particularly important," he added, "in the constantly broadening fields of physics, chemistry, metallurgy, mechanical engineering and food technology in which the engineer now feels the need of post-industrial courses in which significant technical information, carefully selected from the rapidly accumulating mass of scientific knowledge, is evaluated by the standards of sound engineering practice."

A conference on "Friction and Surface Finish" will be held from June 5 to 7 under the direction of Dr. Jerome C. Hunsaker, head of the department of mechanical engineering. This conference will bring together physicists, chemists, metallurgists, oil technologists and designing and producing engineers in a study of problems concerning boundary lubrication, the critical and illusive phenomenon of friction which occurs just before failure. Associated with Dr. Hunsaker in conducting the conference will be Dr. Robert B. Williams, head of the department of metallurgy, and Dr. John Wulff, of the same department, and Professor John H. Lessells, of the department of mechanical engineering.

The eighth International Conference on Spectroscopy will be held from July 15 to 17. The program includes discussion of the spectroscopic analysis of materials and other applications of spectroscopy to biology, medicine, chemistry, metallurgy, mineralogy and industrial and engineering problems. The conferences will be directed by Dr. George R. Harrison of the department of physics.

The solution of complex scientific and engineering mathematical problems with the aid of the differential analyzer of the institute will be the subject of a conference on the "Center of Analysis," which is to be held under the direction of Dr. Samuel H. Caldwell from July 8 to 12. The differential analyzer, now recognized as the outstanding means of solving ordinary differential equations, offers scientific workers the opportunity to familiarize themselves with the design and operating characteristics of the machine.

Powder metallurgy will be discussed in a late summer conference from August 29 to 31. This conference will bring to the institute a group interested in the fundamental scientific and engineering problems of powder metallurgy, as well as the present state of industrial application and possible future developments and research which are necessary to advance this significant process. The conference will be under the leadership of Dr. John Wulff, who is a recognized authority in this field.

Special summer courses will include spectroscopy and its applications, which will be given from June 1 to August 1, under the direction of Dr. Harrison. Courses in general bacteriology and public health bacteriology, directed by Dr. Cecil G. Dunn and Dr. John W. Williams, of the department of biology and public health, will be offered to public health workers, as well as to students, teachers and technicians in the various fields of public health. The course on general bacteriology will be given from June 10 to 28 and that on public health bacteriology from July 1 to 19.

Dr. Ernst A. Hauser will continue his summer course on theoretical and applied physics and physics of matter in the colloidal state from June 17 to June 20.

A summer program in public health, school health, and health education leading to the certificate in public health, will begin this summer under the auspices of the department of biology and public health under the direction of Dr. Clair E. Turner. The program will cover four years in summer courses. The staff will include Dr. John W. Williams and Dr. Murray P. Herwood, and the course will be given from July 1 to August 21.

There will also be a summer program in food technology from July 1 to July 19, under the direction of Dr. Bernard E. Proctor. The course will meet the demand for advanced knowledge on the basic sciences pertaining to food and technical processes of production, manufacture, storage and distribution.

Professor Frederick H. Norton, of the department of metallurgy, will lead a summer conference on ceramics, dealing with ceramic molding processes. This conference, which will be held from July 8 to 13, will consider problems in methods of forming clay wares, a field in which there have been a number of recent developments of special interest.

Professor John T. Rule, chairman of the section of engineering drawing and descriptive geometry, will be in charge of a course on graphics for teachers of mechanical drawing, which is to be given from July 8 to August 16.

The division of city planning will offer a course on the principles and techniques, legislation and administration in city planning from July 8 to 26, under the direction of Professor Frederick J. Adams.

The well-established summer course on principles of textile analysis will again be given this summer by Professor Edward R. Schwarz from July 22 to August 30. Photoelasticity, a new summer course, will be given from July 22 to August 2, under the direction of Dr. William M. Murray, of the depart-

ment of mechanical engineering. The course is designed to meet the need for instruction in this method of stress analysis and is expected to be of value to industrial research workers interested in the development of photoelasticity laboratories.

Professor Ralph E. Freeman, head of the department of economics and social sciences, and Professor George F. Wadsworth, of the department of mathematics, will give a joint course on statistical methods from September 4 to September 14.

Graduate courses in chemistry will be offered from June 10 to August 2. This program is in charge of Professor Leicester F. Hamilton, of the department of chemistry.

THE NATIONAL ACADEMY OF SCIENCES

ABSTRACTS OF PAPERS

(*Continued from p. 423*)

Upward movement of salt in the plant, with special reference to metabolic activities of roots: D. R. HOAGLAND, T. C. BROYER and P. R. STOUT. Previous investigation has proved that accumulation of salt by the plant from the nutrient medium depends on aerobic metabolism of root cells. The relation of root activities in salt accumulation to movement of salt to the shoot has now been studied from several points of view. For certain purposes it has been necessary to conduct experiments over short periods of time with tracer elements, not initially present in the plant. Bromide ions and salts of the radioactive isotopes of Br, Na, P and K have been utilized. One of the authors (P. R. Stout) has developed technique for showing in graphic manner the general distribution of radioactivity in the plant by effects produced on x-ray films. Several general cases of salt movement are recognized: (a) under influence of root pressure, (b) as affected by transpiration, (c) movement under conditions conducive to root injury produced by high salt (*e.g.*, NaCl) concentrations. Xylem exudates may very rapidly build up concentrations of salt much higher than those of the external solution. This may occur even before the roots have attained their maximum capacity for salt accumulation. The phenomenon is related to oxygen supply to roots, concentrations and kind of salt supplied, and indirectly to photosynthesis. Soluble organic nitrogen compounds and organic acid can also move in the exudate dependent on metabolic activities of the root and nature of salt supplied. The effects of $KHCO_3$ are particularly interesting in connection with organic acid metabolism. Young active barley plants may absorb and translocate nutrient ions almost as readily in the dark as in the light, over brief experimental periods. Such plants may grow normally for some time with nutrients supplied only during the diurnal dark periods. With large plants, or those less capable of developing root pressure, rapid upward movement of salt depends on transpiration which may thus indirectly influence absorption of salt by the root. Further evidence was obtained on the path and rate of upward and downward movement of PO_4 by the use of radioactive phosphorus.

Mutations and reversions in reproductivity of Aspergilli with nitrite, colchicine and d-lysine: CHARLES THOM and ROBERT A. STEINBERG. Injury mutants showing loss in reproductive capacity have been obtained thus far with eight species of Aspergilli through the use of nitrite. The interpretation of amino group destruction in proteins of the genetic mechanism is rendered more probable by similar positive results obtained with ninhydrin, chloramin-T, hydriodic acid and hexamethylenamine (formin). Somewhat similar mutants were obtained with colchicine with *Aspergillus nidulans, A. fischeri, A. flavus, A. alliaceus,* and *A. fumigatus. A. variecolor, A. amstelodami* and *A. niger* presumably required higher concentrations of colchicine. Use of excess calcium carbonate to prevent hydrolysis of colchicine to colchiceïn was found necessary for positive results, though the metabolic effect of neutrality may also be a contributary factor. Partially successful attempts based on theoretical chemical considerations have been made to reintroduce amino groups assumed to have been destroyed by the action of nitrite through the use of high concentrations of d-lysine, and of reducing agents (sodium thiosulfate) in neutral solution. Mutations showing partial to full reversion in reproductivity were obtained with *A. amstelodami* and *A. niger.*

The soil as a source of microorganisms antagonistic to disease-producing bacteria: SELMAN A. WAKSMAN and H. BOYD WOODRUFF (introduced by Charles Thom). Fresh field and garden soils contain a large number of microorganisms which are antagonistic to disease-producing bacteria. When these bacteria are introduced into the soil, as in the excreta of patients suffering from various diseases, as well as in the dead bodies of men and animals, they are rapidly destroyed by the corresponding antagonists. As a result of this, the soil can hardly be considered as a source of epidemics and as a carrier of the more common infectious diseases. A special method was developed for demonstrating the presence and abundance of antagonistic microbes, based upon the use of living bacteria as the sole nutrient. It was established by means of this method that the introduction of large numbers of disease-producing bacteria into the soil leads to their rapid disappearance and is accompanied by a rapid multiplication of antagonists. Particular attention was paid to certain gram-negative bacteria, especially members of the coli-aerogenes group and *Brucella abortus.* Two specific bacteria and several actinomycetes were isolated from the soil and shown to possess the property of antagonizing these gram-negative bacteria, as well as various gram-positive forms. By the use of three bacteria of varying degrees of sensitivity (*Sarcina lutea, Bacillus mycoides* and *Escherichia coli*) as standards of measurement of inhibition, it was found that the active substance

produced by the above antagonists was largely thermostable, passes through a bacterial filter, is absorbed by charcoal and is soluble in ether. The active substance obtained by ether extraction prevented the growth of the three bacteria in concentrations of 1: 250,000, 1: 50,000 and 1: 12,500, respectively. The inhibitory effect of the active substance against *B. abortus* fell between *B. mycoides* and *E. coli*. The substance also possesses a strong bactericidal action.

Respiratory metabolism of the porpoise: LAURENCE IRVING, P. F. SCHOLANDER and S. W. GRINNELL (introduced by C. E. McClung). As a species of small-toothed whale the porpoise, *Tursiops truncatus*, encounters the respiratory difficulties common to all whales. We have examined in nine porpoises the characteristics of breathing and internal respiration in order to see how the respiration of whales proceeds and to gain light on how mammalian respiration operates when breathing is infrequent. During the course of our observations the porpoises usually breathed from two to four times a minute and during each respiratory pause the heart gradually slowed to about 40 beats per minute and then increased to about 80 a few seconds after taking a breath. Heart records were taken with the electrocardiograph. During a two-minute dive in the open sea the heart slowed to about 30 and remained retarded during active swimming under water. It appears likely that the bradycardia is associated with the elective control of the circulation which is known to exist in several mammals during apnea. For comparison with the cardiac response in man it was found that the heart rate of a practiced and able diver at Silver Springs, Florida, slowed while he stood quietly under water to about 30. Even while swimming vigorously under water the bradycardia persisted. Measurements of the respiratory metabolism of porpoises weighing about 180 kg by means of a large Krogh spirometer showed that each inspiration took in from 6 to 10 liters and about 10 per cent. of that volume of oxygen was utilized. The resting oxygen consumption was about one liter per minute. At each expiration the lungs were almost completely emptied, the residual air being determined at about 20 per cent. of the inspired air. The alveolar CO_2 was between 7 and 10 per cent. It appears that porpoises are like several other diving animals which are relatively insensitive to CO_2. During or after a forced dive of two or three minutes' duration it was remarkable that the alkali reserve of the blood changed very little, and scarcely any increment of lactic acid appeared either in blood or muscles. Although fatal asphyxia could be caused in three minutes the absence of the acid as a sign of anaerobiosis was surprising. These observations point out the mechanics and dimensions of the respiratory system in the porpoise. They also show how certain typical mammalian respiratory mechanisms operate under the peculiar conditions in which an aquatic mammal lives.

Fats and oils as protective repositories of neurohumors and other chemical activators: G. H. PARKER. The color changes in catfishes are controlled by three chief neurohumors, intermedin from the pituitary gland, acetylcholine and a concentrating neurohumor probably adrenaline from the dispersing and the concentrating nerve-fibers, respectively. Of these three the two from the nerves, acetylcholine and adrenaline, are soluble in fats and oils. Acetylcholine induces a dispersion of melanophore pigment and consequently a darkening of the fish. Adrenaline on the other hand concentrates this pigment and blanches the fish. When acetylcholine has been discharged for some time from the dispersing nerves it accumulates in the fatty or lipoid constituents of the tissues about the melanophores and in consequence continues the dispersion of pigment for some time after the dispersing nerves have ceased to act. It can be extracted in measurable amounts from dark fish skins. This substance, very important for nerve action generally, escapes destruction by choline esterase by its retreat into fatty materials where it is temporarily stored. The same appears to be true of adrenaline, another important general nerve activator. Thus the fatty or lipoid substances in the animal body may serve as storage reservoirs for agents that may be of first consequence in the animal economy. This storage activity of lipoids for important activating agents has not received the attention of biologists that it probably deserves.

A readily demonstrated physiological difference between the red blood cells of different species: M. H. JACOBS. The red blood cells of different species of vertebrates differ in a striking and apparently constant manner both in their normal permeability to dissolved substances and in the manner in which this permeability is altered by external conditions. For specific distinctions among the mammals by the permeability method glycerol is a particularly useful substance, but it has the disadvantage of requiring rather long times for the necessary measurements. The related substance, ethylene glycol, of lower molecular weight and greater penetrating powers, has been found to give almost equally reliable results in times which for the individual observations are measured in seconds rather than in minutes. Curves obtained by plotting against pH (between 4.2 and 8.2) the times of hemolysis in 0.3 M ethylene glycol solutions buffered with a phosphate-phthalate mixture have proved to be satisfactorily constant and characteristic for each of the 12 species of mammals so far studied, including the commonest laboratory mammals and man. In the examination of approximately 100 samples of blood distributed among these species no case has so far been encountered in which the origin of the blood in question could not be correctly determined by this test alone. Even such closely related species as the albino rat and the albino mouse are readily distinguishable, as are the dog and the cat, the rabbit and the guinea pig, the ox and the sheep, etc. The observed differences are associated in part with differences in permeability and in part with other properties of the cells; a distinction between these various factors can be made by studies of non-hemolytic volume changes of the cells. Cell permeability must be regarded as highly specific both with respect to the cell and to the penetrating substance, and any satisfactory theory of the nature of

the cell surface and of its permeability to solutes must take this specificity into account.

Modification of the human-eye potential by dark and light adaptation: WALTER R. MILES. The human eye, measured under standard conditions previously described, for well-relaxed young adult subjects (33 men), shows an average potential of about $1.10 \pm .03$ mv. Under conditions of constant illumination of 5 millilamberts the potential holds very steadily for a given subject. Reducing the illumination to a value of about .001 ml. it is found that after 5 minutes of dark adaptation the potential has dropped to $0.99 \pm .03$, and after 10 minutes to $0.88 \pm .02$ mv. Changing back to the 5 ml illumination it is found that after 5 minutes in this light the potential has risen to a value of $1.26 \pm .04$ mv. This change from 0.88 to 1.26, a difference of 0.38 mv., proves to be a statistically reliable difference since it has a critical ratio of 5.2. A second experiment showed 0.85 and 0.76 mv for 5 and 10 minutes respectively in the dark, followed by 1.14 mv 5 minutes after the 5 ml light had been turned on. The difference here is also 0.38 mv and gave a critical ratio of 5.9. The eye in adjusting from dark to light (.001 to 5 ml) increases its polarity potential scarcely at all or very slowly in the first 3 minutes. The rise is accelerated in the 4th and 5th minutes and probably continues still longer and then falls to an equilibrium value. These modifications in eye potential appear to depend upon retinal functions and thus offer promise of an objective measure of retinal states and activities that may supplement the subjective threshold methods long used in scientific studies of vision.

The growth of Mount Mazama and the formation of Crater Lake: HOWEL WILLIAMS (introduced by John C. Merriam). Mount Mazama, one of the volcanoes of the High Cascade Chain in southern Oregon, was built during Pleistocene and Recent times. It grew to a height of approximately 12,000 feet, mainly by the outpouring of flows of andesite from a number of vents whose positions changed from time to time. During growth, the volcano was almost wholly covered by glaciers. At their maximum extent, the largest of these spread between 10 and 17 miles from the summit and filled the canyons to a depth of more than 1,000 feet. The moraines left by these glaciers are interbedded with lavas on the caldera wall and the oldest extend even to the edge of the lake. After the period of maximum glaciation, a semi-circular arc of vents opened on the north slope of Mount Mazama, along what is now the north rim of Crater Lake. From these, viscous flows of andesite and dacite were erupted. About the same time, many cones of basaltic cinders were active farther down the sides of the main volcano. Finally, after a long period of quiescence, eruptions of pumice began on an unprecedented scale. At first, the explosions were mild and the ejecta, rising high above the volcano, were dispersed toward the east and northeast by winds. Five thousand square miles of country were covered to a minimum depth of 6 inches. Thereafter the eruptions became more violent and voluminous. The pumice was no longer projected high above the vents but rushed down the mountain sides in the form of glowing avalanches or *nuées ardentes*, some of which raced down the canyons for no less than 35 miles, burning the forests in their path. The rapid eruption of this enormous mass of pumice from the magma chamber removed support from beneath the summit of the volcano and led to profound engulfment, forming a caldera between 5 and 6 miles wide and 4,000 feet deep. This catastrophe dates back less than 10,000 years, to a time when this part of Oregon was already inhabited by man. It was followed by the formation of the cinder cone of Wizard Island, the final activity of which occurred only about 1,000 years ago.

Nodal points on crystallization curves of solid solutions: N. L. BOWEN. The crystallization curves in solid solution systems characterized by a valley curve (Tallinie) on the fusion surface have been treated by Schreinemakers for the case of crystallization with perfect fractionation. He did not examine the case of crystallization curves with perfect equilibrium, but a number of other investigators have done so, and they agree that the curves of perfect equilibrium crystallization have points of inflexion where they intersect the valley curve. On the other hand, there is no agreement among them as to the manner of location of the point of intersection with the valley curve. This confused condition suggested a new analysis of the problem which shows that the point of intersection of valley curve and crystallization curve is determined by a simple construction, that a crystallization curve has no unique properties at this point, that some crystallization curves have nodal points but the locus of nodes is a curve which is independent of the valley curve.

General symmetry: EDWARD KASNER. Symmetry in elementary geometry and art is usually defined with respect to a straight line or point as base. One method of generalizing to any basic curve leads to conformal symmetry and functions of an ordinary complex variable. Another method, explained in the present paper, leads to *equilong symmetry* and functions of a dual variable. Equilong symmetry preserves distances, just as conformal symmetry preserves angles. In equilong symmetry, corresponding lines are parallel and the mid-line is tangent to the base curve. The lines touching the base curve remain fixed. In the equilong theory, parallel curves become parallel curves. No analogue of this phenomenon appears in the conformal theory. Also while the equilong theory is capable of generalization to space of any dimensionality, the conformal theory is essentially restricted to two dimensions. If we compare a general curve C_1, the transformed curve C_2 and the base curve C_0, we find that the radii of curvature are related by $R_1 + R_2 = 2R_0$. A like relationship is valid for derivatives (with respect to inclination) *of all orders.* This is in contrast to the conformal theory where the average value theorem (for curvature) is valid only up to the second order. The group generated by all symmetries is discussed. The case where the base curve is a circle is elaborated. Any such transformation is *not* a Laguerre inversion, but may be expressed as the product of three Laguerre inversions. It has been shown by De Cicco in my seminar that a reverse equilong trans-

formation of period two is either an equilong symmetry or of a certain new type (equivalent to line symmetry) without a base curve.

Minimal surfaces of unstable ring type: MARSTON MORSE and CHARLES B. TOMPKINS, II. We are concerned with a generalization of theorems concerning minimal surfaces which go back to Newton. Minimal surfaces are surfaces which are locally curved away from the tangent plane in equal degree on both sides. Stable minimal surfaces are those of least area. Soap films assume the shape of minimal surfaces to a very high degree of approximation. Let there be given two circles with distinct parallel planes and with centers on the same axis of rotation. These circles will bound two minimal surfaces of revolution each generated by a segment of catenary, provided the two circles are not too far apart. One of these surfaces will be of minimizing type and stable, and the other non-minimizing and unstable. These surfaces are "ring surfaces"; that is, they are continuous images of a plane circular ring. Our theory includes the following generalization of this classic result. Let the two circles be replaced by two simple closed curves g_1 and g_2 of class C^1. Instead of being planar, suppose g_1 and g_2 have convex projections on suitably chosen planes. Instead of having distinct containing planes suppose g_1 and g_2 are separated by a plane. *If g_1 and g_2 bound a "ring" minimal surface of minimizing type, g_1 and g_2 also bound a ring minimal surface of non-minimizing type.* In developing this theory it was necessary to reinvestigate many portions of the classical theory and in particular to obtain new and stronger theorems concerning the first variation. In general, the work is based on the topological theory of critical points of functionals as developed by Morse. One of the technical details depends upon results recently obtained by Professor A. E. Pitcher concerning "Sum functions on product spaces." An essential characteristic of the methods is the replacing of classic concepts such as that of a critical point by broader topological concepts involving no derivatives. This analysis in the small is combined with the appropriate group theoretic analysis in the large.

(*To be concluded*)

SPECIAL ARTICLES

ALLEGED GONADOTROPIC EFFECT OF ROYAL JELLY

FEMALE larvae of the honeybee (*Apis mellifera* L.) develop into members of the queen or worker caste depending upon the food and care received during larval development. The mature queen is nearly twice as large as the worker and has highly developed ovaries which nearly fill the abdomen.

It is not uncommon for workers to lay unfertilized eggs, although such individuals may have not more than 8–10 ovarioles compared with upward to 340 for the queen. All newly hatched female larvae have rudimentary ovaries capable of developing into the functional organs of the queen caste. However, the number of ovarioles decreases during the late larval and pupal stage of the worker.[1]

Heyl[2] recently suggested that royal jelly, or larval food, secreted by the honeybee "might contain an active principle that would behave like a gonadotropic or growth hormone." In support of this idea he reported that the injection of dilute sodium hydroxide and aqueous pyridine extracts of royal jelly had resulted in a precocious development of the Graafian follicles in immature rats.

In connection with investigations under way on the physiology of reproduction of the honeybee, royal jelly has been assayed for gonadotropic activity, with results that are not in line with those of Heyl. The data from two assays are presented in Table I. Aqueous extracts of acetone-dried royal jelly were used for one assay, and aqueous pyridine extracts for the other. Eight immature female rats, 21 days old, selected from a closely inbred strain, were used as the experimental animals, four for each assay, one of each group serving as a control. The rats in each group were litter mates. The injections were made twice daily for 3 days, and the animals were autopsied 24 hours after the last injection.

TABLE I

ASSAY OF ROYAL JELLY OF THE HONEYBEE FOR GONADOTROPIC EFFECT ON RATS

Rat No.	Equivalents royal jelly injected	Weight of rat		Weight of ovary	Weight of thymus	Weight of adrenal
		Initial weight	Final weight			
	mg	*gm*	*gm*	*mg*	*mg*	*mg*
	Acetone-dried royal jelly					
1	100	38.6	51.0	15.0	182.1	15.2
2	200	38.5	50.0	15.3	144.9	14.5
3	400	36.5	48.5	14.7	172.3	10.8
4	Control	39.5	53.5	18.9	250.9	12.8
	Aqueous pyridine extracts of royal jelly					
5	1000	34.0	41.1	11.4	93.6	16.1
6	2000	31.0	39.8	12.7	86.7	11.0
7	3000	33.0	34.5	11.0	21.5	15.6
8	Control	41.0	54.1	14.6	219.5	13.2

It will be noted that all animals increased in weight during the period of the injection. The ovarian weights of the animals injected with extracts were not greater than those of the controls; furthermore, upon microscopic examination little, if any, follicle stimulation was observed. Histological study of the vagina showed no effects of theelin. The thymus weights of the experimental animals were reduced, whereas the adrenals showed little effect of the injections of royal jelly.

It is concluded from these preliminary assays that

[1] E. Oertel, *Jour. Morph. and Physiol.*, 50: 295, 1930.
[2] H. H. Heyl, SCIENCE, 89: 540, 1939.

a substance which causes follicle stimulation in the white rat is not present in the royal jelly of the honeybee. However, more detailed work may demonstrate the presence of a gonadotropic substance which may or may not be associated with caste production in the honeybee.

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CRYSTALLINE DROSOPHILA EYE-COLOR HORMONE

THE development of eye color in Drosophila is known to be controlled by specific diffusible substances desiginated as v^+ and cn^+ hormones. Khouvine, Ephrussi and Chevais[1] and Tatum and Beadle[2] have shown that these substances are amino acid-like in nature. The former authors in testing various amino-acids for v^+ hormone activity obtained results which indicated that tryptophane, when added to the larval food, was concerned with hormone production. This "tryptophane effect" was found to be due to the production by certain bacteria of a substance with v^+ hormone activity.[3]

This bacterially produced v^+ hormone has now been obtained in a pure crystalline state. The bacteria were grown on an agar medium containing dead yeast, sugar and l-tryptophane. The agar and yeast were precipitated in 80 per cent. alcohol. The hormone was then taken up in a mixture of butyl alcohol, ethyl alcohol and water, and was finally precipitated from absolute butyl alcohol. It was then crystallized from 90 per cent. ethyl alcohol. The crystals are very light yellow, elongated plates, usually forming in rosettes. The elementary analysis (made under the direction of Dr. A. J. Haagen Smit, of the California Institute of Technology) supports the empirical formula $C_{21}H_{34}N_2O_{14}$.

The crystalline hormone has an activity of approximately 20,000,000 v^+ units per gram[4] when a solution is injected into vermilion brown test larvae. Table I shows that within the limits of accuracy of the biological test, repeated recrystallization does not change the activity.

TABLE I

BIOLOGICAL ACTIVITY OF CRYSTALLINE v^+ HORMONE[4] (0.28 γ INJECTED PER LARVA)

Times hormone recrystallized	Maximum eye-color value	v^+ units per fly	v^+ units per gram hormone
1	3.1	6	21,400,000
2	3.1	6	21,400,000
3	3.3	7	25,000,000
4	2.9	5	17,900,000

[1] Y. Khouvine, B. Ephrussi and S. Chevais, *Biol. Bull.*, 75: 425, 1938.

[2] E. L. Tatum and G. W. Beadle, *Jour. Gen. Physiol.*, 22: 239, 1938.

[3] E. L. Tatum, *Proc. Nat. Acad. Sciences*, 25: 486, 1939.

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EFFECT OF EMANATIONS FROM SEVERAL SPECIES OF FUNGI ON RESPIRATION AND COLOR DEVELOPMENT OF CITRUS FRUITS

THE vapors given off by single moldy lemons inoculated from pure cultures were passed at a constant rate through cotton tubes into jars filled with 50 to 60 sound fruits. Respiration was determined by absorbing the CO_2 evolved in a solution of barium hydroxide. During this determination, which consisted of three one-hour tests, the container with the moldy fruit was disconnected from the jar. Hence the respiration values are for the sound fruit only and do not include the carbon dioxide given off by the moldy fruit.

The most pronounced effects were produced by the emanations from fruits inoculated with *Penicillium digitatum* (green mold), as demonstrated by a typical case in Fig. 1. The response was similar in 12 other

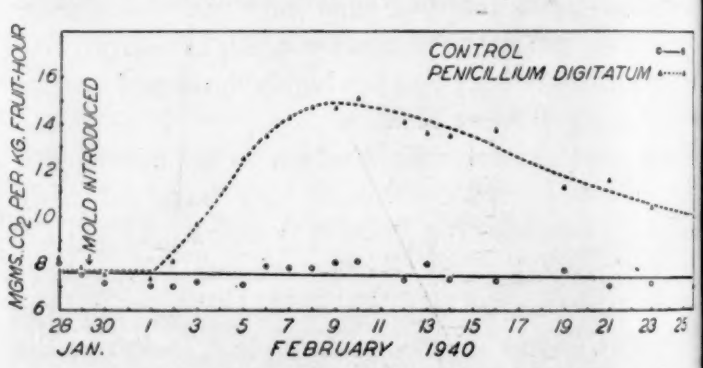

FIG. 1. Respiration of lemons as affected by the vapors of *Penicillium digitatum*.

experiments on lemons and in one test on oranges. The increase in CO_2 evolution by fruit subjected to green mold vapors over the control varied from 50 to 100 per cent. The activity of this fungus is definitely inhibited by low temperatures (2° C.), while higher temperatures (25° C.) do not appear to cause any accelerated effect as compared with 14.5° C. used normally for these experiments. It seems that there are no specific substances present in the fruit which are essential for the production of the active vapor, because *Penicillium digitatum* grown on an agar medium (to which dextrose and potato broth was added) brought about the same results.

Another striking feature of these tests is the very

[4] See reference cited in footnote 2 for significance of eye-color values and units.

TABLE I

RELATIVE RESPIRATION VALUES OF LEMONS UNDER THE INFLUENCE OF THE VAPORS OF SEVERAL FUNGI

Treatment	January														
	5	6	7	8	9	10	11	12	13	15	17	19	20	23	27
Control	100	99	99	101	100	97	99	99	88	91	89	90	85	78	82
Penicillium digitatum ..	100*	113	129	151	233	196	176	176	157	172	169	187	176	143	178
Penicillium italicum ...	100*	102	102	103			106			107		113		98	101
Sclerotinia sclerotium .	100*	93	97	105			104			102		110		89	83
Aspergillus niger	100*	94	94	102			99			95		103		84	83

* Mold placed in series with jars.

much reduced activity or complete lack of response by the fruit to the emanations of the other fungi as evidenced by Table I.

P. italicum (blue mold) appears to produce a slight effect, much less than that of green mold, though these two species are closely related physiologically. The other species, as well as *Oospora* and *Alternaria* which were tested in other experiments, did not seem to bring about any acceleration of the CO_2 evolution.

Rapid yellowing of green lemons was observed in all cases in which emanations of green mold were passed over the fruit. A slight increase in the rate of color development took place under the influence of blue mold, with no effect produced by the vapors of the other fungi. Shedding of stem ends was caused by green mold only. Apparently the responses of the fruit to the gaseous products of *P. digitatum* are similar to the effects of ethylene. Definite proof as to the production of this substance by the fungus is hoped to be obtained by direct chemical analyses. Detailed discussion of these experiments will be forthcoming in the *American Journal of Botany*.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A CONVENIENT APPARATUS FOR THE MANIPULATION OF EGGS IN THE STUDY OF THE CHORIO-ALLANTOIC MEMBRANE

IN the study of the lesions produced by viruses of vaccinia and ectromelia on the chorio-allantoic membranes of chick and duck embryos using annular oblique incident illumination, it was found by Himmelweit[1] that it was necessary to raise the membrane until it was in close contact with a coverslip which was sealed over the opening in the shell. He found that the natural air sac could be inflated by exerting gentle pressure, by means of a rubber tube, to the opening which had previously been made in the wall of the natural air sac for the purpose of lowering the membrane. During our study by high power microscopy of the virus of infectious myxomatosis on the chorio-allantoic membranes of eggs the piece of apparatus here described was developed.

After culturing the virus of infectious myxomatosis on the chorio-allantoic membrane according to the technique of Goodpasture and associates,[2] the shell was broken down to allow an opening of from 2 to 3 cm in diameter, and a layer of vaseline and paraffin mixed in equal parts was built up around this opening to a height of approximately 2 mm above the cut edge of the egg-shell. A few drops of saline were then placed on the membrane and a coverslip was sealed to the paraffin wall according to the method described by Himmelweit. The egg was sealed onto a spoon holder as described by one of us.[3] A piece of 7 mm glass tubing, the end of which had been previously flared to increase its diameter, was sealed over the hole in the wall of the natural air sac by means of paraffin, not by Ash's Model Cement as used by Himmelweit. This glass tube was held firmly in position by means of an ordinary wooden clothespin fastened to a No. 5 cork stopper, as shown in Fig. 1. A rubber tube provided

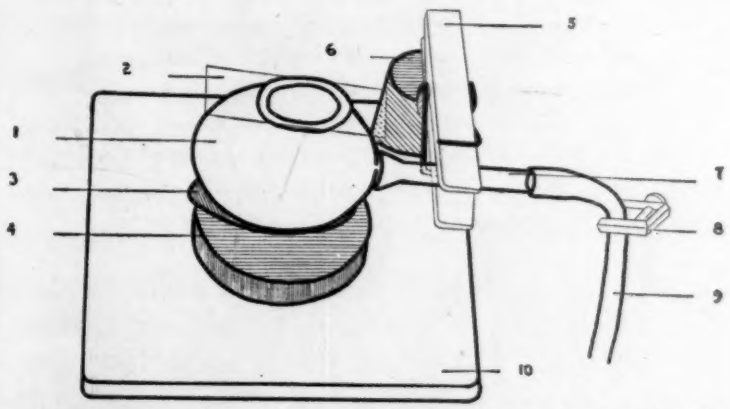

FIG. 1. 1. egg; 2. coverslip; 3. spoon; 4. metal lid; 5. clothespin; 6. cork; 7. glass tube; 8. screw clamp; 9. rubber tubing; 10. wooden base.

with a screw clamp was fitted to the other end of the tube. The entire apparatus was securely fastened to a small wooden base which could be held in the hand.

[1] F. Himmelweit, *Brit. Jour. Path.*, 19: 2, 108–123, 1938.

[2] A. Woodruff and E. Goodpasture, *Amer. Jour. Path.*, 8: 209–222, 1931.

[3] R. E. Hoffstadt, Stephen Pilcher and Elizabeth Osterman, SCIENCE, 86: 356, 1937.

After a small hole had been made in the paraffin wall to allow air to escape from the artificial air sac, the egg was ready for manipulation of the membrane into position in contact with the coverslip by inflation of the natural air sac. Holding the egg tilted away from the opening in the paraffin wall, air pressure was applied by blowing gently through the rubber tube. The air pressure was carefully controlled by means of the screw clamp while the opening in the wall was sealed by the application of a pair of heated forceps to the glass immediately above it. The screw clamp was then closed tightly.

These membranes were found to remain in contact with the coverslip from two to seven days, or could be lowered and raised again at will. If desired, the glass tube can be removed from the egg and the opening in the wall of the natural air sac sealed with the vaseline and paraffin mixture. The apparatus is cheap, convenient and easily constructed.

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A TUBE FOR NITROGEN PURIFICATION

WE have found it necessary to devise a rugged, high capacity tube for the removal of traces of oxygen from nitrogen for our work in an oxygen-free atmosphere. Several designs of tubes have been described[1,2] that appear to have certain unique features. However, our apparatus is rugged, efficient, inexpensive and can be constructed in a very short time from materials available in most laboratories. These characteristics make it seem worthwhile to describe the apparatus briefly here.

The apparatus is described pictorially in Fig. 1.

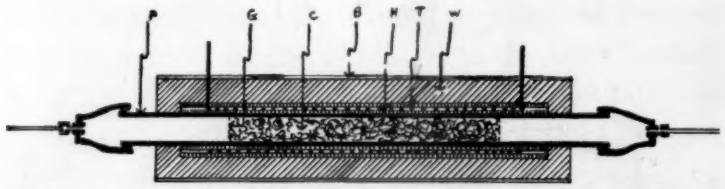

FIG. 1. P—iron pipe; G—copper gauze; C—copper turnings; B—asbestos paper; H—Nichrome wire (heater); T—asbestos tape; W—asbestos wool.

In brief, the apparatus is as follows: a 2 inch × 24 inch iron pipe is fitted with reducers to each end of which is attached a 1 foot length ⅜ inch copper tubing by means of sleeves and connectors. The copper tubing can be sealed easily to a glass line or rubber tubing by means of de Khotinsky cement or sealing wax. The tube is packed with fine, bright copper turnings to serve as the oxygen remover; the turnings are held in place with loose wads of copper screen. The outside of the iron pipe is wrapped with three layers of asbestos tape then wound with 40 feet of No. 18 Nichrome wire (0.4 ohm per foot) to serve as the heater coil. This is wrapped with two layers of asbestos tape, then with a 1½-inch layer of asbestos wool (commercial asbestos), held in place with two layers of asbestos paper and finally with several more layers of asbestos tape. The temperature may be regulated by means of an outside resistance. In fact it is highly desirable to calibrate the external resistance for several temperatures in the heater pipe.

The copper may be regenerated by slow, careful flushing with hydrogen.

A safety feature that is desirable in the use of any of these oxygen-removal tubes is a bottle of alkaline pyrogallic acid through which the purified gas may be passed after it leaves the heater tube; the pyrogallic acid will become discolored as it is exposed to and reacts with oxygen. This will serve both as an indicator of the efficiency of the tube as well as a safety trap to remove traces of oxygen should they not be removed in the hot tube. After the pyrogallic acid has become appreciably discolored it should then be replaced with a fresh solution and the copper must be regenerated. If the rate of flow of gas through the heated tube is very rapid it may be necessary to cool the gas before passing it through the pyrogallic acid solution. This is done easily by using a longer piece of copper tubing as an exit tube, coiling it several times and placing the coil under a stream of cold water.

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1 E. C. Kendall, SCIENCE, 73: 394, 1931.
2 Savage and Ordal, *ibid.*, 91: 222, 1940.

BOOKS RECEIVED

ALLEN, CHARLES F. H., Editor. *Organic Syntheses.* Pp. 113. 6 figures. Wiley. $1.75.

BAKER, ROBERT H. *An Introduction to Astronomy.* Second edition. Pp. 315. Illustrated. Van Nostrand. $3.00.

HAMMETT, LOUIS P. *Physical Organic Chemistry.* Pp. x + 404. Illustrated. McGraw-Hill. $4.00.

KILBY, CLINTON M. *Laboratory Manual of Physics.* Second edition. Pp. vi + 146. 84 figures. Van Nostrand. $1.75.

MCKAY, HERBERT. *Odd Numbers or Arithmetic Revisited.* Pp. 215. Cambridge University Press, Macmillan. $2.50.

OLSON, HARRY F. *Elements of Acoustical Engineering.* Pp. xv + 344. Illustrated. Van Nostrand.

RUIZ, HIPÓLITO. *Travels of Ruiz, Pavón, and Dombey in Peru and Chile (1777–1788).* Translated from the Spanish by B. E. Dahlgren. Pp. 372. Field Museum. $3.50.

SNYDER, EMILY E. *Biology in the Making.* Pp. xii + 539. Illustrated. McGraw-Hill. $2.80.

SPECK, FRANK G. *Penobscot Man.* Pp. xx + 325. 81 figures. University of Pennsylvania Press. $4.00.

VERRILL, A. HYATT. *Wonderful Creatures of the Sea.* Pp. xvi + 272. Illustrated. Appleton-Century. $3.00.

YUNCKER, T. G. *Flora of the Aguan Valley and the Coastal Regions near La Ceiba, Honduras.* Pp. 245–346. 4 figures. Field Museum. $0.75.

ZIPORYN, I. *Cosmo-Retardation.* Pp. 251. 10 figures. Dexter Publishing Company, Detroit.